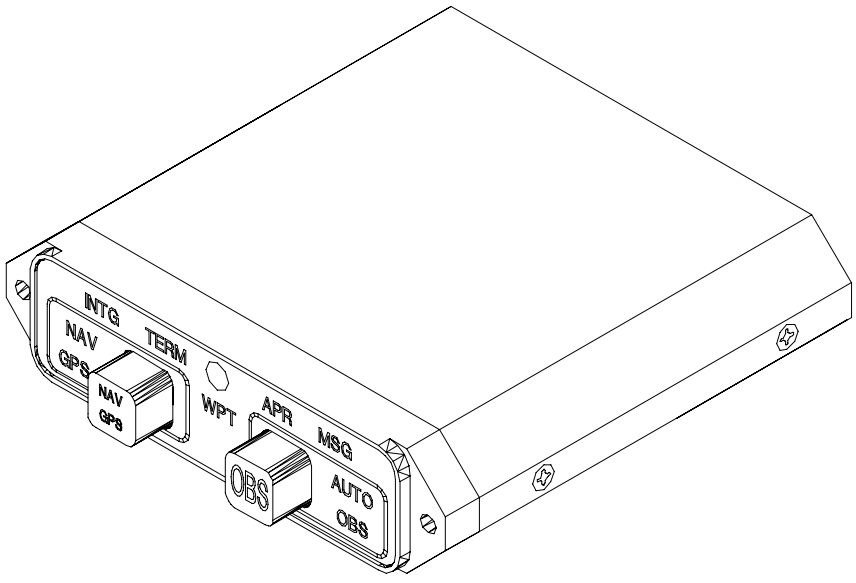
MID-CONTINENT
INSTRUMENTS

# INSTALLATION MANUAL AND OPERATING INSTRUCTIONS

## MD41-( ) Series GPS Annunciation Control Unit for GARMIN GPS 400/500, GNC 420 and GNS 430/530 Series Navigation Management System

| | | |
|---|---|---|
| MFG. P/N: MD41-1408A | 28VDC | Horizontal Mount |
| MFG. P/N: MD41-1404A | 14VDC | Horizontal Mount |
| MFG. P/N: MD41-1418A | 28VDC | Vert. Mount (shown on page 10) |
| MFG. P/N: MD41-1414A | 14VDC | Vert. Mount (shown on page 10) |

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**9400 E. 34th Street N., Wichita, KS 67226 USA** **REV. 1 Nov. 28, 2006**
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# Revision Detail

| Rev. | Date | Detail |
|---|---|---|
| N/R | 05-30-2000 | Complete issue |
| 1 | 11-28-06 | Added (A), (W) and (TAWS) receivers |
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ENVIRONMENTAL QUALIFICATION FORM

# SECTION 1 GENERAL DESCRIPTION

## 1.1 INTRODUCTION

The MD41-( ) is a compact, self -contained GPS Annunciation and Control unit. It combines all the necessary functions required to interface the Garmin GPS 400/500, GNC 420/520 and GNS 430/530 approach certified GPS receivers with the MD41-244/248 remote mounted relay transfer system. In addition, the MD41-( ) contains several GPS status annunciations used to indicate modes selected by the front panel switches and various inputs from the GPS receiver.

A special ILS override feature has been incorporated to cause the MD41-( ) to automatically switch to the NAV mode when the NAV (VOR) receiver is tuned to an ILS frequency. Other features include dual 20,000 hour lamps used for all annunciations, internally lighted selection switches and automatic photocell dimming. A external annunciation dimming adjustment is provided for balancing low level light conditions.

The MD41-140XA/141XA series annunciation control unit must be installed with the companion MD41-244/248 series Relay Unit or the Bendix/King KI 208A/209A course deviation indicator to be approved as a complete TSO'd system.

## 1.2 SPECIFICATIONS, TECHNICAL

### 1.2.1 PHYSICAL CHARACTERISTICS

| | |
|---|---|
| Mounting: | Panel |
| Width: | 3.25 Inches |
| Height: | 0.80 Inches |
| Depth: | 3.20 Inches |
| Weight: | 0.50 lbs. |

### 1.2.2 ENVIRONMENTAL CHARACTERISTICS

| | |
|---|---|
| TSO Compliance: | TSO C129 |
| Applicable Documents: | RTCA DO-160C, DO-208 |
| Operating Temperature Range: | -55°C to +70°C |
| Humidity: | 95% Non-Condensing |
| Altitude Range: | 0 to 55,000 ft. |
| Vibration: | Cat. M and N |
| Operational Shock: | Rigid Mounting, 6 G Operational<br>15 G Crash Safety |

### 1.2.3 SPECIFICATIONS, ELECTRICAL

| | |
|---|---|
| Design | All Solid State |
| MD41-1404A/1414A (14VDC) | 0.40 Amps |
| MD41-1408A/1418A (28VDC) | 0.30 Amps |
| MD41-1408A(5V)/1418A(5V) (28DC) | 0.30 Amps |

### 1.2.4 FRONT PANEL CONTROLS AND ANNUNCIATIONS

#### 1.2.4.1 CONTROLS

| | |
|---|---|
| NAV/GPS | Alternate action switch, when pressed, will select NAV (VOR) GPS presentation on HSI |
| OBS | Momentary action switch, when pressed, will select between AUTO and OBS modes. |

#### 1.2.4.2 ANNUNCIATIONS

| | |
|---|---|
| NAV | NAV (VOR) information presented on the HSI or CDI. |
| GPS | GPS information presented on the HSI or CDI. |
| TERM | Annunciated when operating within 30 miles of departure or arrival airport. |
| APR | GPS is actively engaged in the approach mode. |
| OBS | This will activate the course selector and also disable the automatic GPS waypoint sequencing. |
| AUTO | This will disable the course selector input to the GPS and will enable automatic GPS waypoint sequencing. |
| MSG | GPS message alert, from the GPS receiver. |
| WPT | GPS waypoint alert, from the GPS receiver. |
| INTG | Integrity annunciator, illuminates when GPS receiver detects a position error, or is unable to calculate integrity of position. |

### 1.2.5 INTERFACE

| | |
|---|---|
| NAV annunciation J1 Pin 2 | Receives ground from transfer relay when relays are in NAV mode. |
| GPS annunciation J1 Pin 1 | Receives ground from transfer relay when relays are in GPS mode. |

1.2.5 INTERFACE (cont.)

| | |
|---|---|
| Lamp Test<br>J1 Pin 7 | Receives ground from remote test switch to light all annunciations.(optional conn.) |
| TERM annunciation<br>J1 Pin 3 | Receives a logic low from the GPS receiver to annunciate TERM. |
| OBS select<br>J1 Pin 12 | Provides a logic low to the GPS receiver when OBS is depressed. |
| APR annunciation<br>J1 Pin 9 | Receives a logic low from the GPS receiver when is active on the approach. |
| MSG and WPT annunciation | A logic low will cause the appropriate annunciation to illuminate. GPS receiver must be able to accept 100ma. |
| ILS Override<br>JI Pin 14 | Receives a logic low from the NAV (VOR) receiver when tuned to an ILS frequency. |
| INTG annunciation<br>J1 Pin 20 | Receives a logic low from the GPS to annunciate Integrity. |

### 1.2.6 EQUIPMENT LIMITATIONS

The MD41-( ) series control units contain specific dash numbers to be used with various GPS receivers. The installer must match the correct controller part number with the GPS receiver being installed.

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator.

The MD41-1404A/1414A/1408A/1418A/1408A(5V)/1418A(5V) ACU **MUST** be installed with the Mid-Continent Inst. MD41-244/248 remote transfer relay or the Bendix/King KI 208A/209A course deviation indicator in order to be approved as a complete TSO system. These items will not be TSO'd if one is installed without the other.

The MD41-1404A/1414A/1408A/1418A/1408A(5V)/1418A(5V) is TSO'D and certified for use with the Garmin GPS 400/500, GNC 420/520 and GNS 430/530 GPS systems. This includes the (A), (W) and TAWS versions. Any attempts to install the listed units in an installation other than the listed GPS receivers is prohibited. **This will void the TSO.**

**NOTE:** Anytime the MD41-( ) is disconnected or removed from the aircraft, the HSI/CDI will default to NAV (VOR) mode.

### 1.2.7 MAJOR COMPONENTS

This system is comprised of two major components, the MD41-140XA/141XA series GPS Annunciation Control Unit and the MD41-244/248 Remote Relay or the Bendix/King KI 208A/209A course deviation indicator.

# SECTION 2 INSTALLATION CONSIDERATIONS

## 2.1 COOLING

No direct cooling is required. As with any electronic equipment, overall reliability may be increased if the MD41-( ) is not located near any high heat source or crowded next to other equipment. Means of providing a gentle air flow will be a plus.

## 2.2 EQUIPMENT LOCATION

The MD41-( ) must be mounted as close to the pilot's field of view as possible. The preferable location is near the HSI/CDI that will be displaying the GPS information. The unit depth, with connector attached, must also be taken into consideration. Note: Unlike previous versions of the MD41 Annunciation Control Units (ACU), the transfer relays have been removed and are now remotely mounted in a separate package designated as the MD41-244/248 Relay Unit. This has allowed a for a smaller size ACU which now provides more options for panel mounting. For systems that utilize the Bendix/King KI208A/209A, the transfer relays are internal to the indicator.

## 2.3 ROUTING OF CABLES

Care must be taken not to bundle the MD41-( ) logic and low level signal lines with any high energy sources. Examples of these sources include 400 HZ AC, Comm, DME, HF and transponder transmitter coax. Always use shielded wire when shown on the installation print. Avoid sharp bends in cabling and routing near aircraft control cables.

## SECTION 3 INSTALLATION PROCEDURES

### 3.1 GENERAL INFORMATION

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the MD41-( ). After installation of cabling and before installation of the equipment, ensure that power is applied only to the pins specified in the interconnect diagram.

### 3.2 UNPACKING AND INSPECTING EQUIPMENT

When unpacking equipment, make a visual inspection for evidence of damage incurred during shipment. The following parts should be included:

1. MD41-1404A (14volt) or MD41-1408A (28 volt) Horiz. Mount
   MD41-1414A (14volt) or MD41-1418A (28volt) Vert. Mount
   MD41-1404A8(5V) (28volt) 5 volt button lighting Horiz. Mount
   MD41-1418A(5V) (28volt) 5 volt button lighting Vert. Mount
2. J1 Connector Kit (25 pin). MCI PN 7014517
3. Installation Manual. MCI PN 9010760

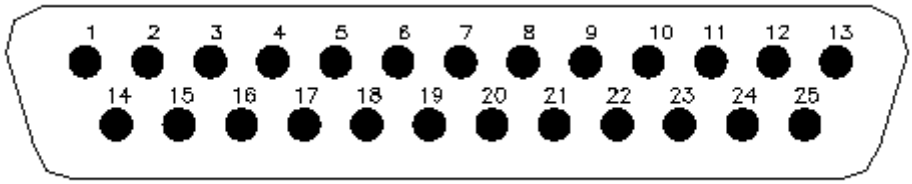
### 3.3 MOUNTING THE MD41-( )

Plan a location in the aircraft for the MD41-( ) to be mounted as close to the pilot's field of view as possible. The preferable location is near the HSI/CDI that will be displaying the GPS information. Avoid mounting close to heater vents or other high heat sources. Allow a clearance of at least 3 inches from back of unit for plug removal.

The indicator is secured in place behind the panel since it is designed for rear mount only. Make a panel cutout as shown in Figure 3-2 Secure the indicator in place with two 4-40 x 3/8 flat head phillips screws.

### 3.4 INSTALLATION LIMITATIONS

Wire the aircraft harness according to figure 3-3. Use at least 24 AWG wire for all connections. Avoid sharp bends and routing cable near high energy sources. Care must be taken to tie the harness away from aircraft controls and cables. Normal installation techniques should be applied. Also see equipment limitations, section 1.2.6.

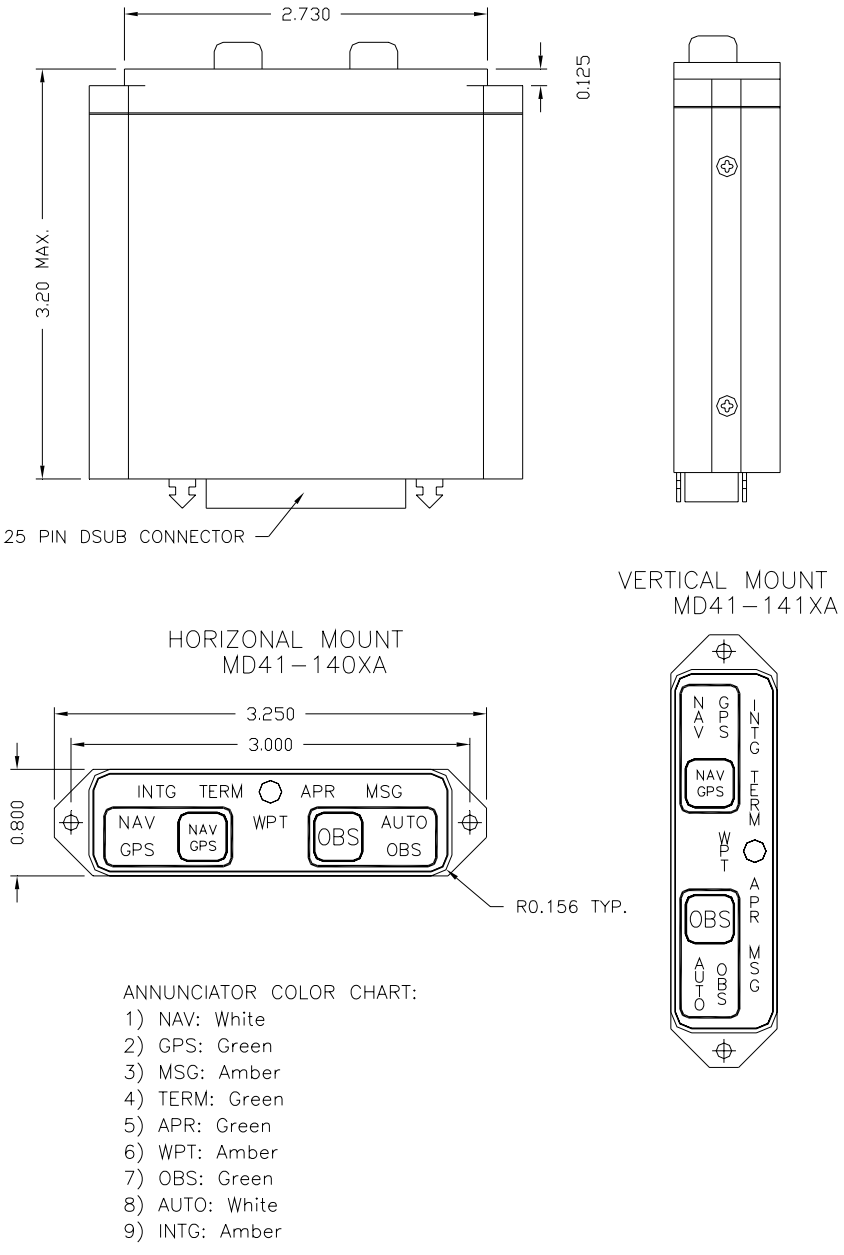



REAR VIEW OF J1 MATING CONNECTOR

J1
PIN NO.

| | |
|---|---|
| 1 ---------- | GPS ANNUNCIATION (receives ground from remote transfer relays) |
| 2 ---------- | NAV ANNUNCIATION(receives ground from remote transfer relays) |
| 3 ---------- | TERM ANNUNCIATION (receives logic low from GPS receiver) |
| 4 ---------- | EXTERNAL RELAY ENERGIZE (provides ground to energize remote transfer relays when GPS is selected) |
| 5 ---------- | DIMMER IN (from aircraft dimming bus) |
| 6 ---------- | SPARE |
| 7 ---------- | LAMP TEST (receives ground from remote test switch)(optional conn.) |
| 8 ---------- | WPT ANNUNCIATION (receives logic low from GPS receiver) |
| 9 ---------- | APR ANNUNCIATION (receives logic low from GPS receiver) |
| 10 ---------- | MSG ANNUNCIATION (receives logic low from GPS receiver) |
| 11 ---------- | SPARE |
| 12 ---------- | OBS SELECT (logic low to the GPS) |
| 13 ---------- | 14 or 28 VDC UNIT POWER (depends on dash number) |
| 14 ---------- | ILS FROM NAV (VOR) REC. (for ILS override) (optional) |
| 15 ---------- | TO NAV CIRCUIT BREAKER (for fault monitoring) |
| 16 ---------- | SPARE |
| 17 ---------- | SPARE |
| 18 ---------- | SPARE |
| 19 ---------- | SPARE |
| 20 ---------- | INTG ANNUNCIATION (receives logic low from GPS receiver) |
| 21 ---------- | SPARE |
| 22 ---------- | SPARE |
| 23 ---------- | SPARE |
| 24 ---------- | OBS ANNUNCIATION (receives logic low from GPS receiver) |
| 25 ---------- | POWER GROUND |

## FIGURE 3-1 SCHEMATIC PINOUT, 25 PIN DSUB

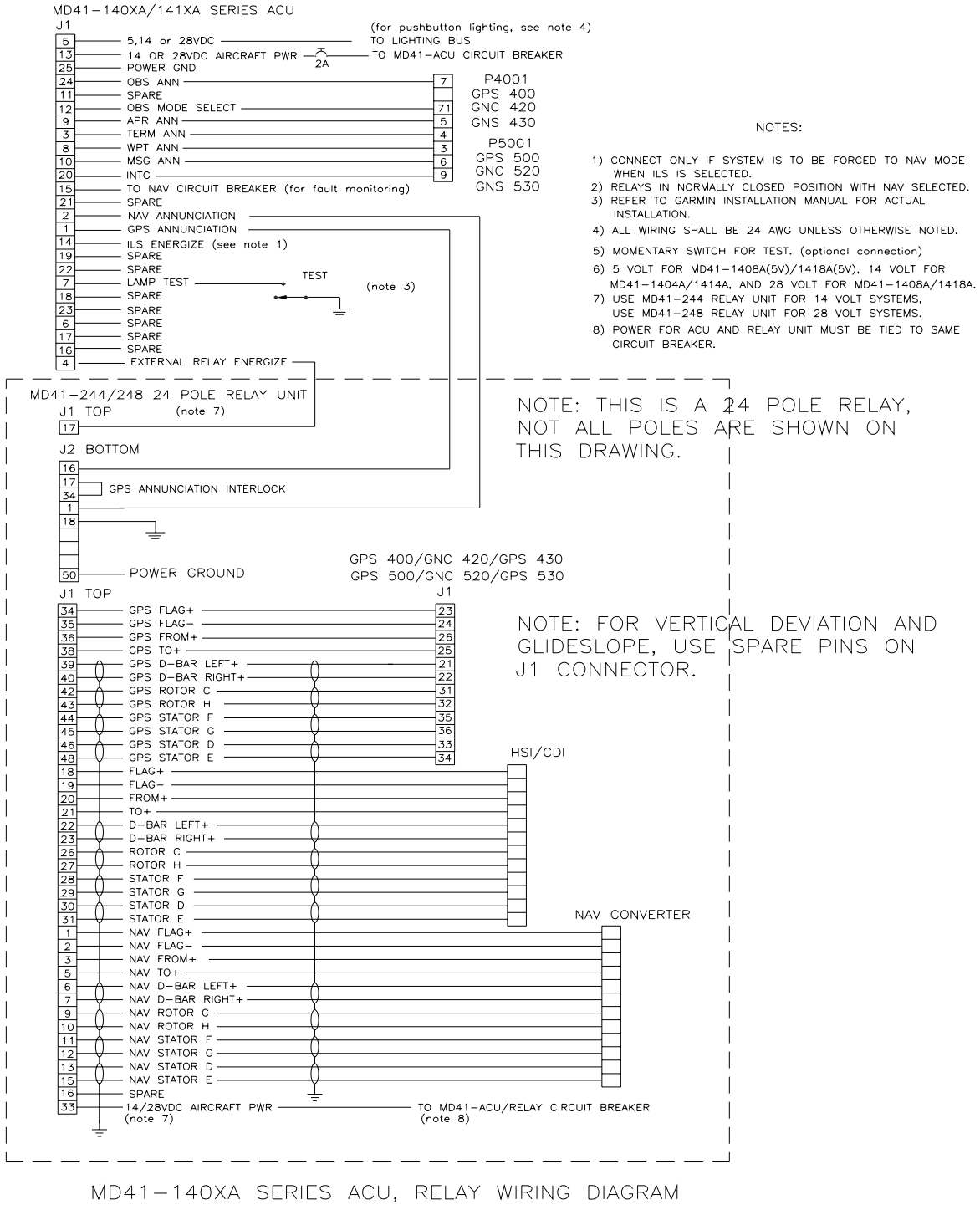



ANNUNCIATOR COLOR CHART:

1) NAV: White
2) GPS: Green
3) MSG: Amber
4) TERM: Green
5) APR: Green
6) WPT: Amber
7) OBS: Green
8) AUTO: White
9) INTG: Amber

Note 1: Use two 4-40 X 3/8" Flat Head Phillips Screws for Mounting

# FIGURE 3-2 OUTLINE DRAWING


MD41−140XA/141XA SERIES ACU
J1
5 5,14 or 28VDC (for pushbutton lighting, see note 4) TO LIGHTING BUS
13 14 OR 28VDC AIRCRAFT PWR 2A TO MD41−ACU CIRCUIT BREAKER
25 POWER GND
24 OBS ANN
11 SPARE
12 OBS MODE SELECT
9 APR ANN
3 TERM ANN
8 WPT ANN
10 MSG ANN
20 INTG
15 TO NAV CIRCUIT BREAKER (for fault monitoring)
21 SPARE
2 NAV ANNUNCIATION
1 GPS ANNUNCIATION
14 ILS ENERGIZE (see note 1)
19 SPARE
22 SPARE
7 LAMP TEST
18 SPARE
23 SPARE
6 SPARE
17 SPARE
16 SPARE
4 EXTERNAL RELAY ENERGIZE
TEST
(note 3)
P4001
GPS 400
GNC 420
GNS 430
P5001
GPS 500
GNC 520
GNS 530
NOTES:
1) CONNECT ONLY IF SYSTEM IS TO BE FORCED TO NAV MODE WHEN ILS IS SELECTED.
2) RELAYS IN NORMALLY CLOSED POSITION WITH NAV SELECTED.
3) REFER TO GARMIN INSTALLATION MANUAL FOR ACTUAL INSTALLATION.
4) ALL WIRING SHALL BE 24 AWG UNLESS OTHERWISE NOTED.
5) MOMENTARY SWITCH FOR TEST. (optional connection)
6) 5 VOLT FOR MD41−1408A(5V)/1418A(5V), 14 VOLT FOR MD41−1404A/1414A, AND 28 VOLT FOR MD41−1408A/1418A.
7) USE MD41−244 RELAY UNIT FOR 14 VOLT SYSTEMS, USE MD41−248 RELAY UNIT FOR 28 VOLT SYSTEMS.
8) POWER FOR ACU AND RELAY UNIT MUST BE TIED TO SAME CIRCUIT BREAKER.
MD41−244/248 24 POLE RELAY UNIT
J1 TOP (note 7)
17
J2 BOTTOM
16
17
34
1
18
GPS ANNUNCIATION INTERLOCK
50 POWER GROUND
NOTE: THIS IS A 24 POLE RELAY, NOT ALL POLES ARE SHOWN ON THIS DRAWING.
GPS 400/GNC 420/GPS 430
GPS 500/GNC 520/GPS 530
J1 TOP
J1
34 GPS FLAG+ 23
35 GPS FLAG− 24
36 GPS FROM+ 26
38 GPS TO+ 25
39 GPS D−BAR LEFT+ 21
40 GPS D−BAR RIGHT+ 22
42 GPS ROTOR C 31
43 GPS ROTOR H 32
44 GPS STATOR F 35
45 GPS STATOR G 36
46 GPS STATOR D 33
48 GPS STATOR E 34
NOTE: FOR VERTICAL DEVIATION AND GLIDESLOPE, USE SPARE PINS ON J1 CONNECTOR.
HSI/CDI
18 FLAG+
19 FLAG−
20 FROM+
21 TO+
22 D−BAR LEFT+
23 D−BAR RIGHT+
26 ROTOR C
27 ROTOR H
28 STATOR F
29 STATOR G
30 STATOR D
31 STATOR E
NAV CONVERTER
1 NAV FLAG+
2 NAV FLAG−
3 NAV FROM+
5 NAV TO+
6 NAV D−BAR LEFT+
7 NAV D−BAR RIGHT+
9 NAV ROTOR C
10 NAV ROTOR H
11 NAV STATOR F
12 NAV STATOR G
13 NAV STATOR D
15 NAV STATOR E
16 SPARE
33 14/28VDC AIRCRAFT PWR (note 7) TO MD41−ACU/RELAY CIRCUIT BREAKER (note 8)

MD41−140XA SERIES ACU, RELAY WIRING DIAGRAM

**FIGURE 3-3 WIRING DIAGRAM, MD41-1404A/1414A/1408A/1418A, 1408A(5V)/1418A(5V), MD41-244/248 for the GPS 400/500, GNC 420 and GNS 430/530 GPS SYSTEMS**

## SECTION 4 POST INSTALLATION CHECKOUT

### 4.1 PRE INSTALLATION TESTS

With the MD41-( ) disconnected, turn on the avionics master switch and verify that aircraft power is on pin 13. Using an ohm meter, verify pin 25 is aircraft ground.

### 4.2 OPERATING INSTRUCTIONS

Turn off the avionics master switch and connect the mating connector to the MD41-( ). Turn on the avionics master switch and the MD41-( ) should come on with the following annunciations.

1. NAV or GPS
3. MSG may be flashing depending on the status of the GPS receiver.

Press the lamp test button, (if installed) all annunciations should light. Continue pressing the lamp test button and cover the photocell window located in the center of the front panel. All annunciations should dim.

Annunciation brightness at the minimum dimming level may be adjusted by rotation of the dimmer control located on the bottom of the MD41-( ) case. CW rotation lowers the dimming level.

Select NAV using the NAV/GPS button. The presentation on the HSI/CDI will now be information from the VOR receiver. Using a VOR test generator or equivalent VOR signal, verify that the presentation and operation of the HSI/CDI is correct. This will include course resolver, left-right meter, to-from meter and nav warn flag. Now select GPS on the MD41-( ) and tune the VOR receiver to an ILS frequency. The MD41-( ) will be forced to NAV mode and ILS information will be displayed on the HSI/CDI. **NOTE**, this feature will not work if "ILS Energize" (J1 pin 14) was not connected at the time of installation.

Next, verify that OBS and AUTO annunciations will cycle alternately when pressing the OBS button two times. GPS/APR test will not work without a valid GPS signal.
Please refer to Section 5 of the Garmin GPS 400/500, GNC 420 and GNS 430/530 installation manual for the remaining system tests.

No periodic maintenance or calibration is necessary for continued airworthiness of the MD41-( ).

**ENVIRONMENTAL QUALIFICATION FORM**

RTCA / DO160C

NOMENCLATURE: MD41-( ) GPS ANNUNCIATION CONTROL UNIT

MODEL NO: MD41-( ) TSO NO: C129

CLASS A1

MANUFACTURER TEST SPECIFICATION: MPS 7015613

MANUFACTURER: MID-CONTINENT INSTRUMENT CO., INC.
9400 E. 34th Street N.
WICHITA, KS 67226 PHONE (316) 630-0101

| Conditions | Section | Description of Conducted Tests |
|---|---|---|
| Temperature and Altitude<br>Low Temperature<br>High Temperature<br>In-Flight Loss of Cooling<br>Altitude<br>Decompression<br>Overpressure | 4.0<br>4.5.1<br>4.5.2 & 4.5.3<br>4.5.4<br>4.6.1<br>4.6.2<br>4.6.3 | Equipment tested to Categories A1 & F2 except as noted<br><br><br>Cooling air not required<br><br><br>Not Tested |
| Temperature Variation | 5.0 | Equipment tested to Category B |
| Humidity | 6.0 | Equipment tested to Category A |
| Shock<br>Operational<br>Crash Safety | 7.0<br>7.2<br>7.3 | Equipment tested per DO-160C<br>Par. 7.2.1 |
| Vibration | 8.0 | Equipment tested without shockmounts to Categories M and N<br>(Table 8-1) |
| Explosion | 9.0 | Equipment identified as Category X, no test required |
| Waterproofness | 10.0 | Equipment identified as Category X , no test required |
| Fluids Susceptibility | 11.0 | Equipment identified as Category X, no test required |

**Environmental Qualification** (cont.)

| Conditions | Section | Description of Conducted Tests |
|---|---|---|
| Sand and Dust | 12.0 | Equipment identified as Category X, no test required |
| Fungus | 13.0 | Equipment identified as Category X, no test required |
| Salt Spray | 14.0 | Equipment identified as Category X, no test required |
| Magnetic Effect | 15.0 | Equipment tested to Class Z |
| Power Input | 16.0 | Equipment tested to Category B |
| Voltage Spike | 17.0 | Equipment tested to Category A |
| Audio Frequency Susceptibility | 18.0 | Equipment tested to Category B |
| Induced Signal Susceptibility | 19.0 | Equipment tested to Category A |
| Radio Frequency Susceptibility | 20.0 | Equipment tested to Category T |
| Radio Frequency Emissions | 21.0 | Equipment tested to Category Z |
| Lightning Induced Transient Susceptibility | 22.0 | Equipment identified as Category X, no tests required |
| Lightning Direct Effects | 23.0 | Equipment identified as Category X, no tests required |
| Icing | 24.0 | Equipment identified as Category X, no test required |
| | | |
| | | |